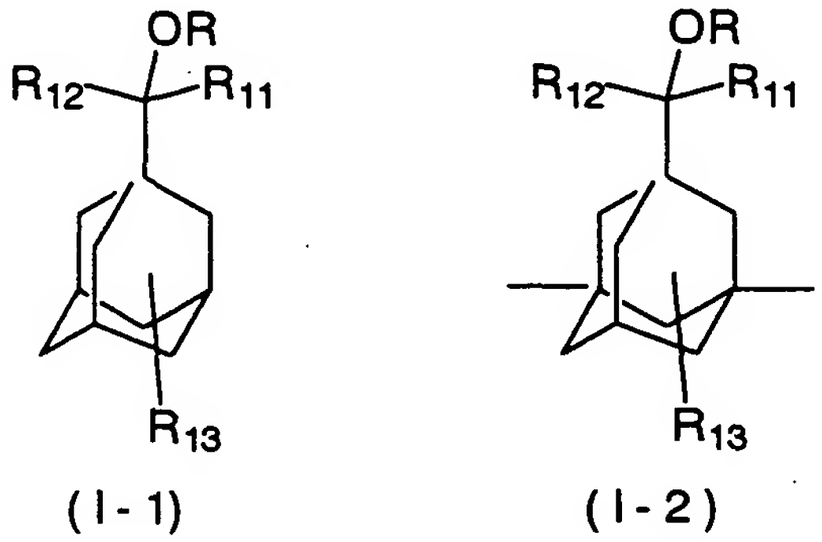
CLAIMS

1. A process for producing a semiconductor device, comprising the steps of:

forming, on an etching film formed on a substrate, a film containing a resist composition which comprises a resist resin obtained by homopolymerizing at least one monomer selected from monomers represented by the general formulas (I-1) and (I-2):



(I-1) (I-2)

wherein R is acryloyl or methacryloyl group, R_{11} and R_{12} are hydrogen atom or a monovalent alkyl group, and R_{13} is OH group, =O group, COOH group or $COOR_{14}$ group (R_{14} is a monovalent organic group), or by copolymerizing the monomer(s) and any other vinyl monomer, and a photo acid generator,

subjecting the film coated onto the substrate to pattern-wise exposure,

developing the film exposed to light, thereby forming a patterned photomask, and

etching an etching film by dry etching, using the photomask as a mask.

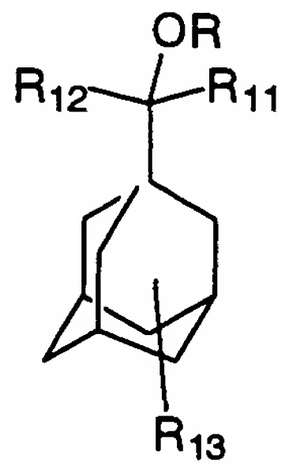
2. The process for producing a semiconductor device according to claim 1, wherein R_{13} is =O group.

3. The process for producing a semiconductor device according to claim 1, wherein at least one of R_{11} and R_{12} contained in the resist resin is selected from the group consisting of C_2H_5 group, C_3H_7 group and C_4H_9 group.

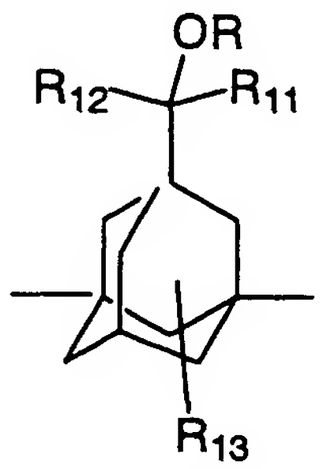
4. The process for producing a semiconductor device according to claim 1, wherein R_{13} is combined with a tertiary carbon atom.

5. A resist composition comprising:

a resist resin obtained by copolymerizing at least one monomer selected from monomers represented by the general formulas (I-1) and (I-2):

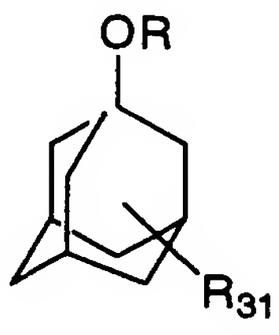


(I-1)

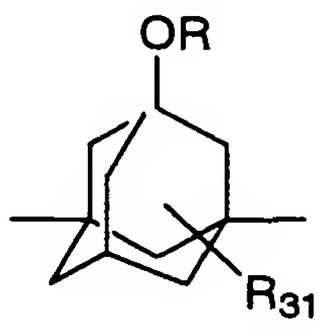


(I-2)

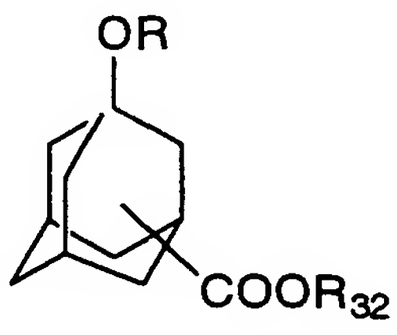
and at least one monomer selected from monomers represented by the general formulas (I-3), (I-4), (I-5), (I-6) and (I-7):



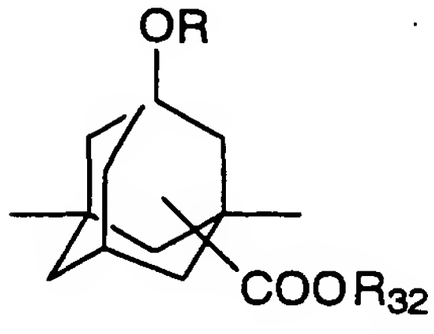
(I-3)



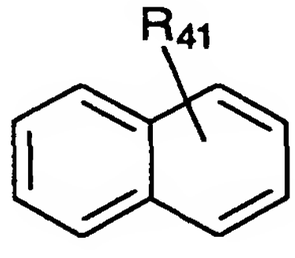
(I-4)



(I-5)



(I-6)



(I-7)

wherein R_{31} is hydrogen atom, or at least one group selected from the group consisting of OH group, OR_{14} group (R_{14} is a monovalent organic group) and =O group, R_{32} is hydrogen atom or a monovalent organic group, and R_{41} is vinyl, acryloyl or methacryloyl group; and

a photo acid generator.

6. A pattern forming process comprising the steps of: forming, on a substrate, a film containing the resist

composition set forth in claim 5,

subjecting the film to pattern-wise exposure, and

developing the film exposed to light.

7. A resist resin having a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring.

8. A resist composition comprising:

a resin having a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring, and

a photo acid generator.

9. The resist composition according to claim 8, wherein three or more oxygen-containing polar groups are combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring.

10. The resist composition according to claim 8, wherein the bridged-bond-containing aliphatic ring is at least one ring selected from the group consisting of adamantane ring, tricyclodecane ring, tetracyclododecane ring and norbornane ring.

11. The resist composition according to claim 8, wherein at least one of the oxygen-containing polar groups is at least one organic group selected from the group consisting of substituted or unsubstituted carboxylic groups, substituted or unsubstituted hydroxyl groups, and substituents containing cyclic lactones.

12. The resist composition according to claim 8, wherein at least one of the oxygen-containing polar groups is carboxyl group protected by a soluble group that can be decomposed by an acid.

13. The resist composition according to claim 8, wherein the resin contains acid anhydride structure, and at least one of the oxygen-containing polar groups is hydroxyl group.

14. A resist composition comprising:

a resin comprising a polymer or condensate of a monomer

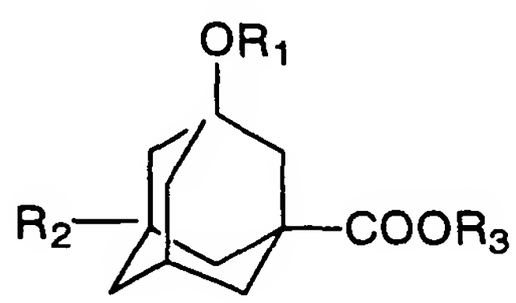
having a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring, and

a photo acid generator.

15. The resist composition according to claim 14, wherein three or more oxygen-containing polar groups are combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring.

16. The resist composition according to claim 14, wherein the resin is a polymer of a monomer having a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring, and at least one of the oxygen-containing polar groups combined with the bridged-bond-containing aliphatic ring in the monomer is acryloyloxy or methacryloyloxy group.

17. The resist composition according to claim 14, wherein the resin is a polymer of a monomer having a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring, and the monomer is a compound represented by the following general formula (II-1):

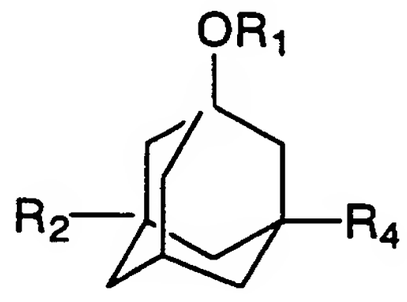


(II - 1)

wherein R_1 is acryloyl or methacryloyl group, R_2 is hydrogen atom or an oxygen-containing polar group, and R_3 is hydrogen atom, a group decomposable by an acid, a cyclic substituent having a lactone, or a substituent having acid anhydride structure formed with a bridged-bond-containing alicyclic compound containing a carboxylic acid.

18. The resist composition according to claim 14, wherein

the resin is a polymer of a monomer containing a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring, and the monomer is a compound represented by the following general formula (II-2):



(II - 2)

wherein R_1 is acryloyl or methacryloyl group, R_2 is hydrogen atom or an oxygen-containing polar group, and R_4 is hydrogen atom, a cyclic substituent having a lactone, or a substituent containing acid anhydride structure formed with a bridged-bond-containing alicyclic compound having a carboxylic acid.

19. The resist composition according to claim 14, wherein the resin is an alicyclic-backbone-type resin obtainable by the dehydration condensation of a monomer having a bridged-bond-containing aliphatic ring, two or more organic groups of at least one of carboxyl group and hydroxyl group being combined with a tertiary carbon atom of the ring.

20. A pattern forming process comprising the steps of:

forming, on a substrate, a film containing a resist composition which comprises a resin having a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring, and a photo acid generator,

subjecting the film to pattern-wise exposure, and

developing the film exposed to light.

21. A process for producing a semiconductor device, comprising the steps of:

forming, on an etching film on a substrate, a film containing a resist composition which comprises a resin having

a bridged-bond-containing aliphatic ring, at least two oxygen-containing polar groups being combined with a tertiary carbon atom of the bridged-bond-containing aliphatic ring, and a photo acid generator,

subjecting the film coated onto the substrate to pattern-wise exposure,

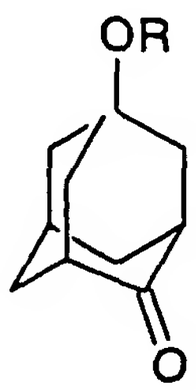
developing the film exposed to light, thereby forming a patterned photomask, and

etching an etching film by dry etching, using the photomask as a mask.

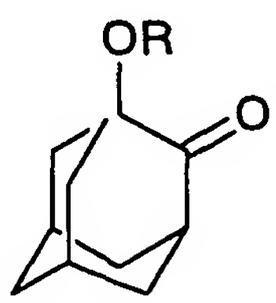
22. A resist composition comprising a resist resin having a bridged-bond-containing aliphatic ring composed of at least two rings selected from the group consisting of 5-membered rings, 6-membered rings and 7-membered rings, and a photo acid generator, wherein at least one carbon constituting the bridged-bond-containing aliphatic ring contained in the resin is combined with oxygen through double bond.

23. The resist composition according to claim 22, wherein the resist resin comprises a unit obtained by polymerizing a monomer that is an acrylate or methacrylate compound having a bridged-bond-containing aliphatic ring composed of at least two rings selected from the group consisting of 5-membered rings, 6-membered rings and 7-membered rings.

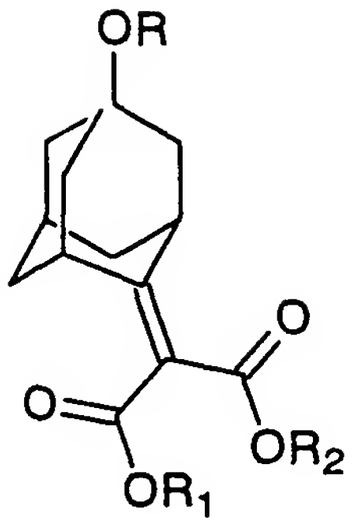
24. The resist composition according to claim 22, wherein the resist resin comprises, as a polymer unit, at least one compound selected from compounds represented by the following general formulas (III-1a), (III-1b), (III-2a) and (III-2b):



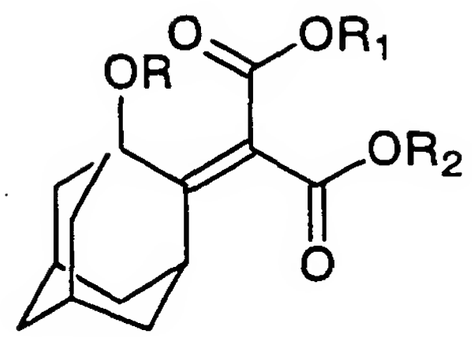
(III - 1a)



(III - 1b)



(III - 2a)

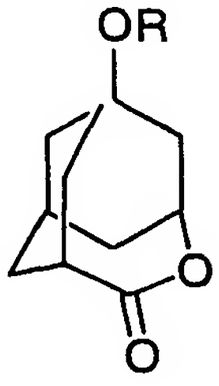


(III - 2b)

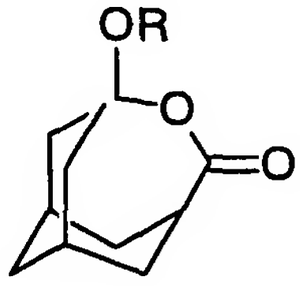
wherein R represents acryloyl or methacryloyl group, and R_1 and R_2 represent an alkyl group or a group decomposable by an acid.

25. The resist composition according to claim 22, wherein at least one of the rings constituting the bridged-bond-containing aliphatic ring contained in the resist resin is a lactone ring.

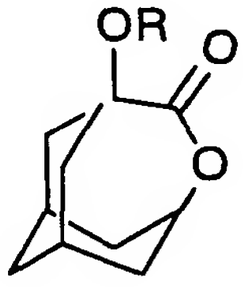
26. The resist composition according to claim 22, wherein the resist resin comprises, as a polymer unit, at least one compound selected from compounds represented by the following general formulas (III-3a), (III-3b), (III-3c) and (III-4):



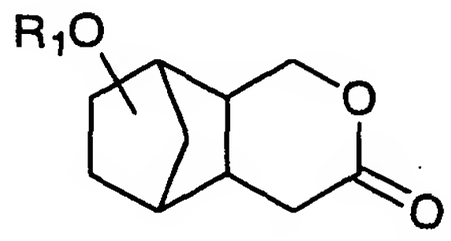
(III - 3a)



(III - 3b)



(III - 3c)



(III - 4)

wherein R and R_1 represent acryloyl or methacryloyl group.

27. The resist composition according to claim 22, wherein the resist resin is selected from the group consisting of polyesters and polyacid anhydrides.

28. The resist composition according to claim 22, wherein

the resist resin is obtained by copolymerization, using a comonomer capable of releasing its bridged-bond-containing aliphatic ring in the presence of an acid to form a carboxylic acid.

29. A pattern forming process comprising the steps of:

forming, on a substrate, a film containing a resist composition which comprises a resist resin having a bridged-bond-containing aliphatic ring composed of at least two rings selected from the group consisting of 5-membered rings, 6-membered rings and 7-membered rings, and a photo acid generator, wherein at least one carbon constituting the bridged-bond-containing aliphatic ring contained in the resin is combined with oxygen through double bond,

subjecting the film to pattern-wise exposure, and

developing the film exposed to light.